GENERAL NOTES.

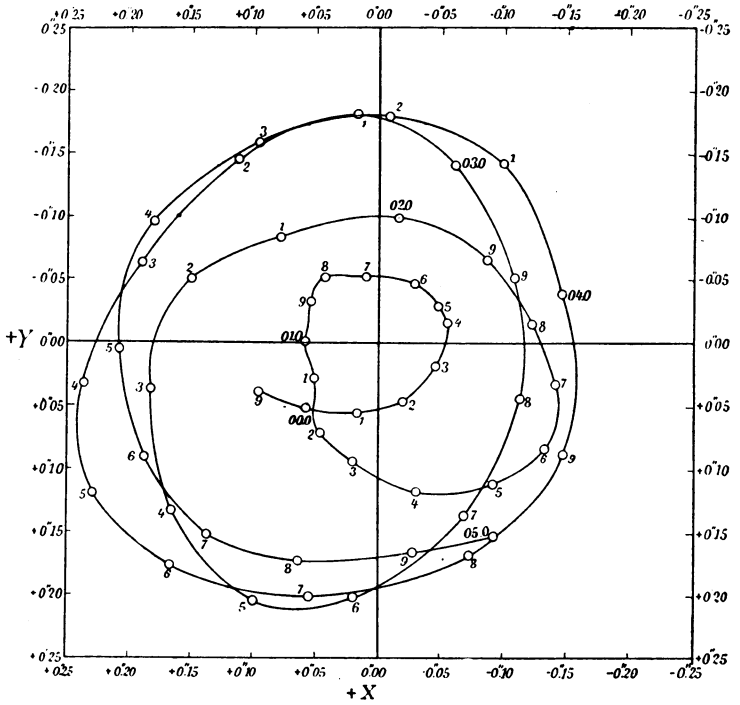
Variation of Latitude.—From the annual report of the work accomplished by the Central Bureau of the International Geodetic Association it appears that the number of latitude determinations made at the various stations established for the purpose of determining the variation of latitude gives a total for 1904 of 11,909, distributed as indicated in the first column of the tabulation given below. The total number of observations made from the time the stations were established, fall of 1899 to the beginning of 1905, is 63,634, distributed as indicated in the second column of the table.

	1904.	Total.
At Mizusawa	1,781	8,464
Tschardjui	1,831	9,285
Carloforte	3,173	16,998
Gaithersburg	1,361	9,378
Cincinnati	1,329	8,038
Ukiah	2,434	11,471

Provisional results for the latitude work of 1904 have been published by Professor ALBRECHT in the *Astronomische Nachrichten* No. 4017. The amplitude of the polar motion was not quite so large as in the preceding year. The motion of the Earth's north pole, from 1899.9 to 1905.0, is represented in the accompanying figure (see opposite page) taken from the number of the *Nachrichten* mentioned above.

No change in the observing programme of the latitude stations has been made since they were established. Ninety-six pairs of stars were selected for observation, and these were divided into twelve groups. For six of the pairs of each group the stars have small zenith-distances, mostly less than 15°. The other two pairs of each group were selected from stars of large zenith-distances, about 60°. These latter, the so-called refraction pairs, were introduced with the idea of detecting, if possible, any abnormal conditions in the refraction, and the latitudes given by them have never been included in the final results. The latitudes determined from the refraction pairs are considerably less accurate than those determined from the zenith pairs, and this is due mainly to four causes: First, at a zenith-distance of 60° the star-images are always, except

under the very best conditions, much more diffuse and unsteady than at small zenith-distances; second, when the telescope is pointed to a large zenith-distance the latitude levels are more likely to be disturbed than at small zenith-distances; third, in observing the stars of the refraction pairs it is necessary for the observer to stand in a rather awkward and unsteady position, and it is not possible to make the most accurate micrometer-settings under these circumstances; fourth, the south star of a refraction pair moves so rapidly that it is impossible for the



observer to make the micrometer-settings with a sufficient degree of deliberation, and the north star of the pair moves so slowly that the heat from the observer's body, which is adjacent to the south ends of the latitude levels, may have a disturbing effect upon them.

Beginning with the first of the year 1906 a change in the observing programme is to be made, and all of the refraction pairs are to be dropped and other zenith pairs substituted. Six of the present zenith pairs are to be replaced with new ones,

and the new pairs are to be selected in such a way that in each group the positive and negative differences of zenith-distances shall very nearly equal zero for the epoch 1908.0, it being the intention to observe on this revised programme until 1910.

The work of the latitude-stations is to be carried on for an indefinite length of time, and two additional stations are now being established in the southern hemisphere. The one in connection with the National Observatory of the Argentine Republic at Cordoba and the other in connection with the observatory at Perth, West Australia. The two stations are on the same parallel, about 32° south, and 180° apart in longitude. It is not possible, from observations in the northern hemisphere alone, to reach sure ground from which to interpret all of the phenomena presented in the variation of latitude.

From No. 4, Band I, *Mitteilungen der Nikolai-Hauptsternwarte zu Pulkowo,* it is learned that a new zenith-telescope, similar to those in use at the International Latitude observatories, has been provided for the Poulkova Observatory. The instrument is somewhat larger than those in use at the International Latitude observatories, and differs from them in some important details, which I hope to discuss at some future time. This instrument is being used in systematic observations for the variation of latitude, and a comprehensive programme has been laid out. On account of the shortness of the summer nights at Poulkova and the long spells of cloudy weather in the winter it has been found necessary to depart considerably from the programme of the International Latitude observatories. Seventy-four pairs divided into nine groups are used instead of ninety-six pairs divided into twelve groups. No stars of a zenith-distance of more than 21° are used. It is noticed from the diagram showing the observing programme, that in summer for a few dates the observations begin before sunset. I do not hesitate to state, judging from my experience in this work, that I believe this to be a mistake. One of the chief sources of error in latitude work by the Talcott method comes from the "bad behavior" of the levels, and this almost always takes place in the early evening hours when the temperature is falling rapidly. At Ukiah it has been noticed that the levels almost invariably behave better during the second half of the night's work than during the first, although in our

programme the shortest interval between sunset and the beginning of observations is one and one half hours. I believe the accuracy of the work could be increased by shoving the whole programme along further into the night. I hope to take up soon an examination of the results thus far published to see if there is any difference between the degrees of accuracy of the results of the first and second halves of a night's work.

In No. 754 of the *Astronomical Journal,* Dr. SCHLESINGER has an article entitled "On Systematic Errors in Determining Variations of Latitude." He says, by way of introduction: "Observations for determining the variation of latitude, however carefully they may be made, seem to be subject to considerable systematic discordances. It is doubtful whether these have their origin in external causes (such as meteorological), or whether their explanation is to be sought in the instrument or in the observer.

"It is obvious that the question can be decided by setting up two instruments side by side, and having two observers make simultaneous observations with them. It will occasionally happen with each instrument that a night's observations will deviate largely from those of the preceding and succeeding nights. If these deviations follow the same course for both instruments, we must conclude that they arise from some external cause, probably beyond the control of the observer.

"The conditions for such a test happen to be well fulfilled by certain observations made before the present subject was in mind. I refer to the two independent series by MARCUSE and PRESTON, at Waikiki, near Honolulu, in the Hawaiian Islands, in 1891 and 1892. The former of these observers represented the International Geodetic Association, the latter the United States Coast and Geodetic Survey. In that day the reality of latitude-variations was still doubted by some, and Hawaii was selected as a site for an observing-station because the latitude-variations at that place should be (and in fact proved to be) the reverse of those at European stations, the difference in longitude being about 180°. 'Two observers were sent, because 'previous experience has shown that a single series may easily suffer interruption because of the illness of the observer, or the failure of the instrument.' Waikiki is on the south side of the island of Oahu, about two

miles southeast of Honolulu. PRESTON'S station was within four hundred feet of the shore, and MARCUSE'S was thirty-one feet north and eighteen feet west of PRESTON'S."

Dr. SCHLESINGER then goes on to reduce the two series to a common basis, and finds as a final result that both of the series are affected by a common systematic error. The investigation does not reveal the cause of these errors; but Dr. SCHLESINGER hopes, in a later paper, to throw some light upon the subject. S. D. T.

The following notes have been taken from recent numbers of *Science*:—

Yale University has conferred its doctorate of science on Professor GEORGE E. HALE, director of the Solar Observatory of the Carnegie Institution.

Information from Ottawa states that the Dominion Observatory has been practically completed. The telescope has been mounted, Astronomer W. F. KING, with his staff, has taken possession of the building, and observation work has begun. The telescope is a refracting instrument 19 feet 6 inches long, with a 15-inch lens. In addition to this telescope, the observatory has a transit, spectroscopic instruments, and the equipment of a first-class institution. The building cost $92,000 and the telescope $14,000.

An astronomical observatory, to be known as the Cecil Duncombe Observatory, is to be established in connection with the University of Leeds. A building with an aluminium dome is being built at one of the highest points of the city, and in it will be placed the telescope recently presented to the university by Captain C. W. E. DUNCOMBE, together with the transit instrument presented by the late Mr. W. E. CROSSLEY.

Princeton University has conferred the degree of Doctor of Laws on Professor CHARLES AUGUSTUS YOUNG, who has this year become professor emeritus of astronomy, after holding the chair at Princeton since 1877.

Columbia University has conferred the degree of Doctor of Science on Dr. R. S. WOODWARD, who has resigned the chair of Mechanics and Mathematical Physics to accept the presidency of the Carnegie Institution.

Oxford University has conferred its Doctorate of Science on GEORGE H. DARWIN, F. R. S., professor of astronomy at Cambridge.

The following extracts have been taken from an account in the *London Times* of the report of the Astronomer Royal to the Board of Visitors of the Royal Observatory, Greenwich:—

Preparations for the approaching eclipse of the Sun were much in evidence. The Astronomer Royal, accompanied by Mr. F. W. DYSON and Mr. C. DAVIDSON, hopes to observe it from Sfax, in Tunis; Mr. E. W. MAUNDER will go to Labrador on the invitation of the Canadian Government, and two other members of the staff hope to go to Palma, in Majorca. The Sfax party propose to carry out the same programme as in 1900 and 1901, except that the 13-inch astrographic equatorial will be used in addition to the Thompson 9-inch coronagraph to obtain large scale photographs of the corona; its spectrum will be photographed with two spectroscopes lent by Major HILLS. Mr. MAUNDER is taking the Dallmeyer 4-inch coronagraph and a 4-inch rapid rectilinear lens, these instruments being mounted equatorially, as a cœlostat—that most convenient adjunct to an eclipse expedition—is unfortunately not available. An attempt is to be made to take some photographs under exactly similar conditions in Labrador and Egypt (the two extremities of the eclipse track), and afterwards combine them in a stereoscope, with a view of determining the structure of the corona in three dimensions, and examining whether any signs of rotation are shown. Since two and one-half hours elapse, it is quite possible that some rotational shift may be visible.

The proper motions of the stars in GROOMBRIDGE'S catalogue have been recently redetermined and classified according to their type of spectrum, a very interesting point standing out clearly from the discussion,—namely, that stars whose spectrum resembles that of our Sun have large proper motions, and, therefore, are presumably nearer to us than the stars whose spectrum resembles that of *Sirius*. It would seem, therefore, that our Sun is one of a cluster of "solar" stars, while the Sirian stars lie in the background, and are apparently associated with the Milky Way.

The "variation of latitude" is now looked upon as an accepted fact, and is applied as a correction to all the meridian observations; it is still, however, considered safer not to use the predicted value, but to wait till the end of the year, and then apply the values deduced by Professor ALBRECHT from the results of all the co-operating observatories. It is found that the application of this correction makes the solar observations in different years more harmonious with one another, and also explains the anomalies in the observations made with the reflex zenith-tube. Since the vindication of the character of this instrument, observations with it have been vigorously pushed forward, more than a thousand observations of sixty-one different stars having been made during the year. It is hoped that, after a few years, this material will supply new values of the constants of aberration and nutation.

The 30-inch reflector presented by Dr. COMMON has been used for the photography of fifty-nine minor planets and four comets. In particular Comet *a* 1904 may be mentioned, as it remained visible for a full year, and was observed on sixty-two nights. This comet was notable for its large perihelion distance, which was 2.7 times the Earth's distance from the Sun. It remained visible till it was quite near the orbit of *Jupiter*. ENCKE'S comet was photographed on one night, and photographs have also been obtained of two other faint comets that were discovered last winter. These cometary photographs are found to give more accurate positions than the visual observations that were formerly obtained, and in consequence the latter have been discontinued.

Great progress has been made with the measurement and reduction of the numerous photographs of the small planet *Eros* with a view of obtaining an improved value of the Sun's distance. The photographs have all been measured, and positions of the reference-stars adopted, and it is expected that the work will be concluded in a few months. The work for the Astrographic Catalogue is now practically completed. The stars have all been measured, but the zone from 77° north declination to the North Pole is not yet printed. The catalogue will contain 178,750 stars, which implies nearly 4,000.000 in the entire heavens, of which the Greenwich zone covers one twentieth. It is proposed in a future volume of the Astrographic Catalogue

to give the star-places in the form of Right Ascension and Declination in addition to the "rectangular coordinates" hitherto printed. This has not yet been finally decided. The photographic enlargement of the chart-plates is steadily proceeding. Over two hundred plates have been copied and distributed to about fifty observatories and representative institutions.